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ERGONOMIC ANALYSIS OF WORKPLACE FURNITURE IN HOSPITALS: A PUBLIC HOSPITAL EXAMPLE

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Abstract

Within the scope of the study, ergonomic analysis of the furniture elements used by the administrative staff working in Düzce University Research and Application Hospital was made. During the period of the study, 137 employees were reached out of 463 personnel working in the study area, and data were obtained with the help of a questionnaire developed by the researcher in accordance with the purpose of the study. Within the scope of the study, the personnel working in the polyclinics, nurses, midwives, and health officers working in the relevant units were reached. It was determined that the participants reached within the scope of the study were predominantly women, their education level (76.6%) was predominantly at least a bachelor's degree, and about half of them had 4-10 years of experience. As a result of the analyses made, it was concluded that the participants knew the ergonomic working conditions, albeit partially. Participants stated that the equipment they will use in their working areas is sufficient. While the participants positively agree with the adequacy of the cleanliness of the work areas, they agree negatively on the spatial and volumetric sufficiency of the work area. As a result of the analysis, it was determined that the participants were satisfied with the use of the computer desk/desk, study chair and material cupboards they used.

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1. Introduction

Ergonomics: It is a word derived from the ancient Greek terms ergo = work and nomus = science and translated into Turkish as "İş Bilim" by the Turkish Language Association. Studies on ergonomics are also called human-machine relations (Sabancı and Sümer, 2015). The complex relationship between ergonomics and human, machine and job demand can be understood. With the help of ergonomics, the balance between human capacity and work demand in daily life and work activities can be established at the highest rate (Keyserling and Armstrong, 2008).

Ergonomics is considered as an important tool for employees in both the private and public sectors to be motivated to work and to increase their work efficiency. For this reason, the science of ergonomics is dealing with making it easier for employees to work in a more comfortable environment and working towards this (Çeven and Özer, 2013).

Both anatomical structures and physical structures of people differ. For this reason, it is important for performance and productivity to be compatible with the basic characteristics of people and what is expected from them. It should not be forgotten that the work efficiency and performance of the employees will increase with the existence of spaces designed in accordance with the employees and the adaptation of the equipment and equipment used to human characteristics. In the study conducted by Yılmazer and Korkmaz (2012), in which the ergonomic factors affecting the design of the workstations in the offices are examined, it is stated that the highest efficiency can be achieved by establishing the necessary ergonomic standards in the working environments. It has been revealed by the related research that if the working environments are not arranged ergonomically, the work efficiency will be adversely affected, and the employees will experience health problems.

In the study of Babayiğit and Kurt (2013) on health workers, it was stated that ergonomic working environments are also important in addition to paying attention to the principles of posture and posture protection in the formation of pain and diseases related to their profession. Therefore, it has been suggested that an ergonomic patient care system that is compatible with physical, social and psychological characteristics should be created in order to increase the quality of life of patients and healthcare professionals in the hospital environment.

In this study, it is aimed to make an ergonomic analysis of the equipment elements (computer desk/desk, study chair and study cupboard) and working areas used by nurses/nurses, midwives, health officers and cleaners working in Düzce University Research and Application Hospital while working in the hospital environment.

2. Materials and Methods

2.1. Material

The research population consists of administrative staff working at Düzce University (DU) Research and Application Hospital. The study was carried out in May-June 2017. At the time of the study, there were nurses, midwives, health officers and a total of 463 personnel working in the polyclinics working in the units related to the use of the materials examined within the scope of the study (Anonymous, 2017).

Although it was aimed to reach all the administrative staff of the DU Research and Application Hospital within the scope of the study, 137 employees could be reached. It has been assumed that the sample reached with the help of the sample determination formula applied in limited societies is statistically representative of the population with a confidence level of 95% and a margin of error of 7% (Lomeshow et al., 1990). The questionnaires obtained from the sample reached within the scope of the study were statistically evaluated with the help of the SPSS (2003) package program.

2.2. Method

A questionnaire was used to obtain data in the study. The questionnaire form used within the scope of the study was filled by the participants by face-to-face interview method. The questionnaire developed by the researcher (Parlar, 2008; Özmen et al., 2009; Çetin et al., 2015; Gedik et al., 2015) consists of 5

parts. There are 14 questions and 61 judgments in the survey. In the first part of the questionnaire used within the scope of the study, some demographic characteristics of the participants were discussed. In the second part of the questionnaire, it was questioned whether the participants had knowledge about ergonomic working conditions. In the third part of the questionnaire, the objects used in the study areas were questioned by the participants. In the fourth part of the questionnaire, the ergonomic design of the working area was questioned. In the fifth and last part of the questionnaire, the ergonomic features/expectations regarding the ergonomic design of the furniture elements used in the working area, computer desk/desk, study chair and study cupboard were questioned.

3. Results

3.1. Validity and Reliability Analysis

The Cronbach Alpha coefficient was used to determine the reliability of the questionnaires used in the study, and the sampling adequacy measure of the questionnaire and Barlett's sphericity test results were examined to see the results of the validity analysis.

Table 1: Reliability and validity results of the questionnaire used

Working Type	Reliability Result Cronbach Alpha Coefficient	Validity Analysis	
		KMO Value	Barlett Value
Workspace ergonomic design features judgments	0.871	0.827	3290.362
Ergonomic design judgments of the computer desk/desk used in the workplace	0.838		
Ergonomic design judgments of the office chair used in the workplace	0.887		
Ergonomic design judgments of material cupboards used in the workplace	0.893		
All scale result	0.954		

As a result of the evaluations made, the general reliability value (Cronbach Alpha Coefficient) for all data was determined as 0.954 as a result of the reliability analysis of the scale used in the research. Reliability analysis results of each subscale used in the study also ranged between 0.838 and 0.893. In the validity of the scale used, the Kaiser Meyer Olkin (KMO) Sampling Adequacy Measure result was 0.827 and Bartlett's Sphericity test was 3290.362; degrees of freedom were found to be df = 741 (p= 0.000) (Table 1). The findings show that the scale used in the study has a high degree of reliability and does not pose a problem in terms of validity (Özdamar, 2002; Kalaycı, 2009).

Tables and figures should be numbered serially and referred to in the text by number.

3.2. Some Demographic Characteristics of the Participants

It was determined that 62% of the participants working in the DU Research and Application Hospital worked in the inpatient services, 16.1% in the intensive care unit, 12.4% in the emergency room and 9.5% in the polyclinic. It was determined that 94.9% of the participants worked as nurses/nurses in this service, 2.1% as midwives, 1.5% as health officers and 1.5% as cleaners.

82.5% of the participants are female and 17.5% are male. 59.8% of the participants were between the ages of 26-35, 26.3% were younger than 25, and 13.9% were 36 and older. When the education levels of the participants were examined, it was determined that 76.6% of them were undergraduate graduates, 16.1% were high school graduates, 4.4% were graduates, 1.5% were associate degree graduates, and 1.5% were primary school graduates.

When the professional experience of the participants was examined, it was determined that 50.4% had 4-10 years of professional experience, 24.1% had 1-3 years, 19% had 11-15 years, 6.5% had 16 years or more professional experience.

3.3. Analysis of Participants' Information on Ergonomic Working Conditions

In this study, in which the ergonomic working conditions of the participants and the ergonomic design features of the furniture fittings they use were examined, it was first questioned whether the participants had knowledge about ergonomic working conditions. While it was determined that 17.5% of

the participants knew what ergonomic working conditions should be, it was determined that 52.6% of them partially knew the ergonomic working conditions and 29.9% of them did not know ergonomic working conditions at all. In the study conducted by Gedik et al. (2015) on Düzce University academic staff, it was determined that 37% of the participating academicians had absolutely no knowledge about ergonomic working conditions in offices and computer use. In the study by Eyi (2020), in which musculoskeletal disorders caused by ergonomic factors in hospitals were examined, it was stated that musculoskeletal disorders and burnout syndrome are two of the most frequently occurring occupational problems in healthcare workers. For this reason, it is thought that it would be beneficial to inform the employees about ergonomic working conditions.

Within the scope of the study, it was determined that 56.2% of the participants wanted to receive information/training about ergonomic working conditions, while 43.8% did not want to receive information/training about ergonomic working conditions.

3.4. Analysis of Objects Used by Participants in their Study Areas

While 76.6% of the participants stated that there were no accessories that would ease their work in their work areas, 23.4% stated that there were accessories that would ease their work in their work areas.

The presence and use of objects in the study areas of the participants are shown in Table 2.

Table 2: Objects found in work areas

Objects	Available (%)	None (%)
Table	94.9	5.1
Chair	95.6	4.4
Height-adjustable swivel office chair	75.2	24.8
Computer	96.4	3.6
Computer table	89.1	10.9
Curtains, blinds to protect from sun and light	73.0	27.0
Bookshelf	19.0	81.0
Cupboard with drawers and shelves	80.3	19.7
Guest couch	34.3	65.7
television, radio	83.9	16.1
Flowers, paintings, etc. objects with a psychological effect	48.9	51.1
Telephone	93.4	6.6
Stand	54.7	45.3

It was stated that objects such as tables, chairs, computers and telephones were found in the study areas of the participants over 90% and were used by the participants. It has been determined that 89% of the participants also have a computer desk in addition to a desk/desk. It was observed that there were no objects with psychological effects such as bookshelves (81%), guest chairs (65.7%), flowers and paintings (51.1%) in the study areas of the participants.

3.5. Analysis of the Ergonomic Design of the Workspace

Within the scope of the study, cluster analysis was used to determine the satisfaction levels of the participants in the ergonomic design of their workspaces. With cluster analysis, meaningful groups or clusters can be formed in the data set that is the subject of the research (Neil, 2002). With cluster analysis, comparison and grouping are made by considering the characteristics of the variables (Kalaycı, 2009).

As a result of the analyses made, the grouping of the research results showing the satisfaction levels of the participants regarding the ergonomic design of the workplaces they use according to their importance levels is shown in Table 3. A statistically significant grouping emerged as 3 groups as a result of the clustering analysis in the data of the satisfaction levels related to the ergonomic design of the workspaces used by the participants ($p<0.05$). The final cluster centres of the 3 groups that emerged were 3.39 for Group 1; It was determined as 3.03 for the 2nd Group and 2.82 for the 3rd Group.

Table 3: Cluster analysis results of participants' satisfaction with their workplace

Judgments	$\bar{x}$	σ	Cluster	Distance
Working areas are regularly cleaned.	3.45	0.97	1	0.058
There are dirty-clean material areas in the working areas.	3.41	0.98	1	0.021
There are sufficient antiseptic and disinfectant materials in the working areas where necessary.	3.39	1.14	1	0.001
Fire extinguisher systems/tools are sufficient in working areas.	3.31	0.82	1	0.077
There are ideal materials-environments (such as curtains, screens or practice rooms) to ensure privacy in work areas.	3.10	1.02	2	0.074
Communication and information flow can be done smoothly in the working areas.	3.05	0.97	2	0.024
The walls are painted with a calming color paint suitable for the technique.	3.03	1.20	2	0.002
The work area is adequately and properly heated.	3.01	1.14	2	0.013
I know what the dimensions of the workspace should be.	2.94	1.07	2	0.087
Guiding and warning signs are sufficient for work areas.	2.90	1.03	3	0.083
The work area is adequately and appropriately illuminated.	2.84	1.07	3	0.018
The working area is adequately and properly cooled.	2.84	1.13	3	0.017
Private resting areas are sufficient in the working areas.	2.83	1.07	3	0.009
The work area is adequately ventilated.	2.80	1.14	3	0.016
The workplace has sufficient area and volume.	2.71	0.94	3	0.111

Likert scale: 1 At least or not at all, 2 Little, 3 Undecided, 4 Much, 5 Most
$\bar{x}$: Arithmetic mean, σ: Standard deviation

In case of satisfaction with the ergonomic design of the working areas used by the participants, it has been determined that the employees are satisfied with the regular cleaning and cleaning of the working areas, the places where the dirty and clean materials are placed separately, the antiseptics and disinfectants necessary for cleaning and hygiene, and the fire extinguishers/systems in the work areas.

It was determined that the participants had problems in terms of the adequacy of the working areas in terms of both area and volume, the insufficient ventilation of the working areas, the lack of private resting places in the work areas, the inability to provide appropriate thermal comfort and insufficient lighting in the work areas, and their satisfaction levels were low. In a study conducted by Çeven and Özer (2013), it was determined that people who work in work environments designed by considering ergonomic working conditions can be better motivated, get less tired, and accordingly, their working performance is higher and they complain less about the discomforts caused by working conditions. . In the study of Gedik et al. (2017), in which the problems experienced by the academic and administrative staff of Düzce University in their office work were analysed, it was determined that the desks used by the participants were not suitable and therefore they experienced discomfort. In addition, it was claimed that the participants also experienced problems due to their computer hardware.

3.6. Analysis of the Ergonomic Design of the Furniture Elements Used by the Participants in Their Work Areas

The furniture used by the participants in the study areas within the scope of the study; used computer desk/desk, used work chair and used drawer cupboards are discussed under 3 sub-headings. The research results showing the ergonomic design satisfaction of the participants for the computer desk/desk they use are shown in Table 4. A statistically significant grouping structure emerged as 3 groups as a result of the clustering analysis in the data of the satisfaction status of the users in the computer desk/desk design used by the participants ($p<0.05$). The final cluster centres of the 3 groups that emerged were 2.94 for Group 1; It was determined as 2.68 for the 2nd Group and 2.49 for the 3rd Group.

Table 4: Cluster analysis results of participants' satisfaction with computer desk/desk design

Judgments	$\bar{x}$	σ	Cluster	Distance
The computer desk has sufficient weight and rigidity.	3.01	1.08	1	0.071
The height of the computer desk is sufficient and suitable	2.95	1.03	1	0.011
The area of the computer desk is sufficient and convenient	2.93	1.03	1	0.004
The area occupied by the printer does not adversely affect the working conditions.	2.86	1.20	1	0.078
Desk lamp (if equipped) illuminates the work area appropriately	2.68	1.19	2	0.001
There are suitable shelves on the desk where files can be placed.	2.68	1.21	2	0.001
I know what the dimensions of the computer desk should be	2.49	1.05	3	0.000

Likert scale: 1 At least or not at all, 2 Little, 3 Undecided, 4 Much, 5 Most
$\bar{x}$: Arithmetic mean, σ: Standard deviation

It was determined that the hardness and stability of the computer desk/desk used by the participants met the user expectations well. In addition, the participants claimed that the height of the computer desks/desktops is sufficient for the usage areas. Although the participants stated that they were satisfied with the use of the computer desk/desk, it was observed that they did not know very well what the ideal dimensions of the computer desk/desk should be. In addition, it was determined that the participants were less satisfied with the adequacy of the local lighting in the working areas (with the desk lamp) and the adequacy of the shelves required for the files on the desks.

The results of the research showing the satisfaction levels of the participants with the ergonomic design of the office chair they use are given in Table 5. A statistically significant grouping structure emerged as 3 groups as a result of the cluster analysis in the data of the satisfaction status of the users in the design of the office chair used by the participants ($p<0.05$). The final cluster centres of the 3 groups that emerged were 3.07 for Group 1; It was determined as 2.94 for the 2nd Group and 2.68 for the 3rd Group.

Table 5: Cluster analysis results of participants' work chair use satisfaction

Judgments	$\bar{x}$	σ	Cluster	Distance
The distance of the chair from the keyboard is sufficient and appropriate.	3.13	1.129	1	0.062
The chair is convenient and has adjustable height.	3.04	1.018	1	0.027
The chair back supports my waist appropriately.	3.04	1.036	1	0.035
The seating surface of the chair has a suitable profile.	3.00	1.137	2	0.062
The chair back has a suitable slope and height for my back.	2.95	.987	2	0.010
There is a suitable clearence volume and footrest that the feet can step on.	2.91	1.188	2	0.029
Chair armrests (if any) have adequate and suitable position.	2.89	1.002	2	0.043
I know what the dimensions of the chair should be.	2.68	1.059	3	0.000

Likert scale: 1 At least or not at all, 2 Little, 3 Undecided, 4 Much, 5 Most
$\bar{x}$: Arithmetic mean, σ: Standard deviation

It can be said that the general satisfaction of the participants regarding the office chair they use is partially low. It can be said that the participants partially do not know what the ergonomic dimensions of the office chair they use should be.

The results of the research showing the satisfaction of the participants with the ergonomic design of the material cupboards they use are shown in Table 6. A statistically significant grouping structure emerged as 3 groups as a result of the clustering analysis made on the data of the satisfaction status of the users in the design of the material cupboards used by the participants ($p<0.05$). The final cluster centres of the 3 groups that emerged were 2.95 for Group 1; It was determined as 2.78 for the 2nd Group and 2.61 for the 3rd Group.

Table 6: Cluster analysis results of participants' satisfaction with the use of material cupboards

Judgments	$\bar{x}$	σ	Cluster	Distance
Material cupboard drawers have sufficient volume.	2.99	0.999	1	0.034
The volume of the material cupboards is not large enough to prevent other working areas.	2.99	0.985	1	0.034
The material does not consume much space when the cupboard doors are opened.	2.93	1.119	1	0.018
The edges of the material cupboards are made so as not to damage them.	2.93	1.121	1	0.025
The compartments of the supply cupboards have the appropriate volume to place the medicines.	2.81	1.022	2	0.022
Material cupboards have sufficient area and volume.	2.76	0.990	2	0.022
Material cupboards are suitably illuminated.	2.66	1.005	3	0.045
I know what the dimensions of the material cupboards should be.	2.57	1.007	3	0.045

Likert scale: 1 At least or not at all, 2 Little, 3 Undecided, 4 Much, 5 Most
$\bar{x}$: Arithmetic mean, σ: Standard deviation

It can be said that the participants do not experience too many problems with the material cupboards they use, since the drawers are of sufficient volume, the dimensions of the material cupboards do not cause any negative effects in the working areas, they do not take up much space when the doors are opened, and the edges are designed in such a way that they do not harm the employees.

It was determined that the participants felt uncomfortable because the material cupboards were not properly and adequately illuminated, and they did not know very well what ergonomic dimensions the material cupboards should be.

In a study conducted by Alp et al. (2012) in a public hospital in the province of Isparta, it was suggested that 96% of the participating healthcare professionals had musculoskeletal problems due to inappropriate working conditions or inappropriate ergonomic designs. In addition, it has been determined that the upper and lower compartments are not ergonomically suitable for the material cupboards used in the study, and although the desks, computer tables and chairs are individually ergonomic, there is no harmony between the chair and the table.

4. Conclusion and Reccommediation

It should not be forgotten that the nurses/nurses, midwives and health officers working in hospital environments spend most of their time at the desk/desk, and the work chairs and the cupboards they use have an important place. Therefore, it should be noted that higher efficiency can be obtained from ergonomically designed reinforcement elements for these users. As a result of the analyses made;

• It can be said that the participants have partial knowledge about ergonomic working conditions. It can be said that it would be beneficial to provide training/information about ergonomic working conditions to the participants.

• It has been determined that 90% of the participants have the objects (table, chair, computer, telephone) they need to carry out their work in their work areas.

• It was determined that the participants were satisfied with the cleanliness and orderliness of the working areas, and the sufficient material required for hygiene. However, it was observed that the participants were not satisfied with the environmental and climatological factors (such as lack of lighting, ventilation, sufficient area, and volume) of the working areas.

• While it can be said that the participants are partially satisfied with the computer desk/desk, work chair and material cupboards they use in their working areas, it has been observed that they do not know what ergonomic dimensions the computer desk/desk they use should be.

• It was determined that the materials cupboards used by the participants were not in sufficient area/volume for them to work comfortably.

It should not be forgotten that the arrangement of the reinforcement elements used from the findings obtained as a result of the analyses, taking into account the ergonomic design principles, will contribute to the higher performance of the employees.

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